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Estimating Ecological Thresholds for PHOSPHORUS in the Everglades

Mercury Emission Estimates from Fires: An Initial Inventory for the U.S.

Earth Systems Engineering and Management: A Manifesto

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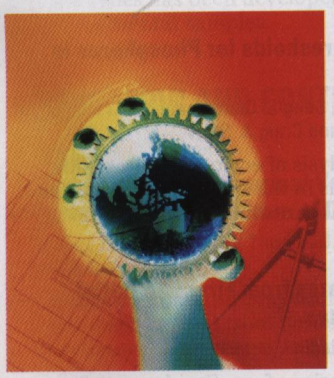
News and Features

NEWS

VIEWPOINT



The anthropogenic Earth is a difficult, highly complex, tightly integrated system that challenges society to rapidly develop tools, methods, and understandings that enable reasoned responses. In Allenby's view, traditional engineering strengths are increasingly inadequate given today's social, economic, environmental, and technological demands. The problems are irreducibly complex and highly transdisciplinary and require substantial changes in the way we think about engineering. We must create solutions in the real world and create future options for changing ecosystems, built environments, and human culture, he writes.

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Research

POLICY ANALYSIS

CHARACTERIZATION OF NATURAL AND AFFECTED ENVIRONMENTS

■ **Supporting information is available free at http://pubs.acs.org/est.**
▶ **This issue contains a news story about this research.**

Cover: Native *Nymphaea* water lilies and saw grass (*Cladium*) grow in this relatively pristine slough in the Florida Everglades. New research in *ES&T* (pp 8084–8091) suggests that the delicately balanced ecosystem may be able to assimilate more phosphorus than previously thought. Photo by Curtis J. Richardson, Duke University Wetland Center.

activity relationship and finds commonly used enzymatic reactions involved in endocrine disrupter biodegradations.

■ 8004

Distribution of Macrolides, Sulfonamides, and Trimethoprim in Tropical Waters: Ubiquitous Occurrence of Veterinary Antibiotics in the Mekong Delta

Satoshi Managaki, Ayako Murata, Hideshige Takada, Bui Cach Tuyen, and Nguyen H. Chiem

The distributions of 12 antibiotics (sulfonamides, macrolides, and trimethoprim) are investigated in the water from the Mekong Delta, Vietnam, and compared with those in the Tamagawa River, Japan.

■ 8011

Diurnal Cycle of PAHs, Nitro-PAHs, and oxy-PAHs in a High Oxidation Capacity Marine Background Atmosphere

Manolis Tsapakis and Euripides G. Stephanou

The gas-phase OH-radical-initiated PAH reaction is the major process that contributes to the ambient burden of nitro-PAHs in a marine background atmosphere.

■ 8018

Variability of the Gaseous Elemental Mercury Sea–Air Flux of the Baltic Sea

Joachim Kuss and Bernd Schneider

Determination of the gaseous elemental mercury sea–air exchange by a newly designed equilibrator coupled with a mercury vapor analyzer reveals that elemental mercury emissions by the Baltic Sea exceed deposition estimates.

ENVIRONMENTAL PROCESSES

■ 8024

Biotransformation of 8:2 Fluorotelomer Alcohol in Soil and by Soil Bacteria Isolates

Jinxia Liu, Linda S. Lee, Loring F. Nies, Cindy H. Nakatsu, and Ronald F. Turco

The dependence of available carbon sources on 8:2 fluorotelomer biotransformation to perfluorooctanoic acid is evaluated and applied to elucidate degradation mechanisms.

■ 8031

Quantifying the Adhesion and Interaction Forces Between *Pseudomonas aeruginosa* and Natural Organic Matter

Laila I. Abu-Lail, Yatao Liu, Arzu Atabek, and Terri A. Camesano

The adhesion of *P. aeruginosa* with natural organic matter is measured directly by using atomic force microscopy; it is related to the properties of the bacterial lipopolysaccharides and extracellular biopolymers.

8038

Assessment of the Interaction between Aquatic Colloids and Pharmaceuticals Facilitated by Cross-Flow Ultrafiltration

Khalid Maskaoui, Andrew Hibberd, and John L. Zhou

Colloids show strong binding power for certain pharmaceutical compounds, with implications for their long-term fate and impacts in aquatic systems.

■ 8044

Size and Density Distribution of Sulfide-Producing Microniches in Lake Sediments

Anders Widerlund and William Davison

The 2D size and distribution of microniches are studied at high spatial resolution by the technique of diffusive gradients in thin films combined with computer-imaging densitometry.

■ 8050

Equilibrium Solubility and Dissolution Rate of the Lead Phosphate Chloropyromorphite

Liyun Xie and Daniel E. Giammar

The equilibrium solubility and dissolution rates of the lead phosphate mineral chloropyromorphite are quantitatively investigated in laboratory experiments.

8056

Facilitated Transport of Diuron and Glyphosate in High Copper Vineyard Soils

Sylvie Dousset, Astrid R. Jacobson, Jean-Baptiste Dessogne, Nathalie Guichard, Philippe C. Baveye, and Francis Andreux

Accumulation of Cu from Bordeaux mixture, in granitic vineyard soils, may increase glyphosate leaching and thus increase the risk of groundwater contamination.

■ 8062

Investigations of the Diurnal Cycle and Mixing State of Oxalic Acid in Individual Particles in Asian Aerosol Outflow

Ryan C. Sullivan and Kimberly A. Prather

The associations between dicarboxylic acids and individual particle types are reported for the first time and provide evidence for a photochemical source of this important atmospheric aerosol component.

■ 8070

Microbially Derived Inputs to Soil Organic Matter: Are Current Estimates Too Low?

André J. Simpson, Myrna J. Simpson, Emma Smith, and Brian P. Kelleher

Microbes from soils are cultured, and their molecular profiles are used to quantify the contributions of microbial biomass to soil organic matter by NMR spectroscopy.

■ 8077

Formation and Transformation of Metastable Double Salts from the Crystallization of Mixed Ammonium Nitrate and Ammonium Sulfate Particles

Tsz Yan Ling and Chak K. Chan

Formation and subsequent transformation of metastable double salts from the crystallization of equal molar ammonium nitrate/ammonium sulfate mixed particles are investigated with an electrodynamic balance coupled with a Raman spectroscopic system.

ENVIRONMENTAL MODELING

8084

▶ **Estimating Ecological Thresholds for Phosphorus in the Everglades**

Curtis J. Richardson, Ryan S. King, Song S. Qian, Panchabi Vaithiyanathan, Robert G. Qualls, and Craig A. Stow

A Bayesian change-point analysis of ecological thresholds tested at multple trophic levels in the Everglades provides a robust estimate of phosphorus thresholds.

■ 8092

▶ **Mercury Emission Estimates from Fires: An Initial Inventory for the United States**

Christine Wiedinmyer and Hans Friedli

Monthly estimates of Hg emissions from fires by state for the continental U.S. for the 5-year period 2002–2006 are presented.

■ 8099

Modeling of Sediment Transport through Stormwater Gravel Filters over Their Lifespan

Nilmini R. Siriwardene, Ana Deletic, and Tim D. Fletcher

A mathematical model is developed of the transport of sediments through storm-water gravel filters during their life span by applying laboratory experimental data to two existing models.

■ 8104

Comparing WHAM 6 and MINEQL+ 4.5 for the Chemical Speciation of Cu in the Rhizosphere of Forest Soils

Benoît Cloutier-Hurteau, Sébastien Sauvé, and François Courchesne

Results from the first study that compares measurements of free Cu by an ion-selective electrode with the performance of the speciation models MINEQL+ 4.5 and WHAM 6 for rhizospheric forest soils are presented.

■ 8111

▶ Reassessing Hypoxia Forecasts for the Gulf of Mexico

Donald Scavia and Kristina A. Donnelly

On the basis of a simple biophysical model, driven by nitrogen and phosphorus loads and calibrated to 1985–2006 Gulf hypoxia, a nitrogen-only or nitrogen-and-phosphorus control strategy is recommended.

8118

Modeling Cation Diffusion in Compacted Water-Saturated Sodium Bentonite at Low Ionic Strength

Ian C. Bourg, Garrison Sposito, and Alain C. M. Bourg

A two-compartment macropore/nanopore model agrees with all experimental data on the tracer diffusion of cations (Na, Sr) in compacted water-saturated Na-bentonite.

ENVIRONMENTAL MEASUREMENTS METHODS

■ 8123

Calibration of an In Situ Membrane Inlet Mass Spectrometer for Measurements of Dissolved Gases and Volatile Organics in Seawater

Ryan J. Bell, R. Timothy Short, Friso H. W. van Amerom, and Robert H. Byrne

Calibration techniques are described for measurements of dissolved gases and volatile organics in marine and freshwaters with an in situ membrane inlet mass spectrometer.

8129

Voltammetric Detection of Cr(VI) with Disposable Screen-Printed Electrode Modified with Gold Nanoparticles

Guodong Liu, Ying-Ying Lin, Hong Wu, and Yuehe Lin

A disposable screen-printed electrode modified with gold nanoparticles has been developed for the detection of Cr(VI) in environmental samples.

REMEDIATION AND CONTROL TECHNOLOGIES

■ 8135

Experimental and Numerical Validation of the Total Trapping Number for Prediction of DNAPL Mobilization

Yusong Li, Linda M. Abriola, Thomas J. Phelan, C. Andrew Ramsburg, and Kurt D. Pennell

Predictions of total trapping number of tetrachloroethene DNAPL displacement from porous media are validated with 2D laboratory experiments and numerical simulations.

■ 8142

Influence of Flow Conditions and System Geometry on Nitrate Use by Benthic Biofilms: Implications for Nutrient Mitigation

Shai Arnon, Christopher G. Peterson, Kimberly A. Gray, and Aaron I. Packman

Maximum rates of nitrate use by benthic biofilms are found under intermediate velocity and 3D net structures because of the coupling between flow and redox gradients.

8149

Electricity Generation from Synthetic Acid-Mine Drainage (AMD) Water using Fuel Cell Technologies

Shaoan Cheng, Brian A. Dempsey, and Bruce E. Logan

A fuel cell operated in fed-batch mode completely removes ferrous iron and generates 290 mW/m^2 at a coulombic efficiency of >97%.

■ 8154

Sustainable Power Generation in Microbial Fuel Cells Using Bicarbonate Buffer and Proton Transfer Mechanisms

Yanzhen Fan, Hongqiang Hu, and Hong Liu

Microbial fuel cells that use bicarbonate buffer produce the highest reported power density.

■ 8159

Nitrogen Removal via Nitrite from Municipal Wastewater at Low Temperatures using Real-Time Control to Optimize Nitrifying Communities

Qing Yang, Yongzhen Peng, Xiuhong Liu, Wei Zeng, Takashi Mino, and Hiroyasu Satoh

Nitrogen removal via nitrite from real municipal wastewater is achieved at normal and low temperatures in a sequencing batch reactor pilot-plant through long-term application of real-time control.

■ 8165

Gibberellic Acid, Kinetin, and the Mixture Indole–3-Acetic Acid–Kinetin Assisted with EDTA-Induced Lead Hyperaccumulation in Alfalfa Plants

Martha L. López, José R. Peralta-Videa, Jason G. Parsons, Tenoch Benitez, and Jorge L. Gardea-Torresdey

Phytohormones are shown to assist with EDTA-induced lead hyperaccumulation.

SUSTAINABILITY ENGINEERING AND GREEN CHEMISTRY

■ 8171

Removal of Pharmaceuticals and Personal Care Products (PPCPs) from Urban Wastewater in a Pilot Vertical Flow Constructed Wetland and a Sand Filter

Víctor Matamoros, Carlos Arias, Hans Brix, and Josep M. Bayona

VFCW is shown to be a feasible technology to remove most PPCPs that occur in domestic wastewater from small populations, allowing the design of more compact systems.

ECOTOXICOLOGY AND HUMAN ENVIRONMENTAL HEALTH

■ 8178

▶ Exposure to Copper Nanoparticles Causes Gill Injury and Acute Lethality in Zebrafish (*Danio rerio*)

Robert J. Griffitt, Roxana Weil, Kelly A. Hyndman, Nancy D. Denslow, Kevin Powers, David Taylor, and David S. Barber

Exposure to copper nanoparticles induces gill injury and acute lethality at low-parts-per-million concentrations, and dissolution of nanocopper is insufficient to explain the observed results.

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